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(12) # EUROPEAN PATENT SPECIFICATION

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(54) **A method for producing an endless belt with a smooth inner surface for use in a papermaking extended nip press.**

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DE-A- 3 318 984
GB-A- 2 106 557

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Description

This invention relates to a method for producing an endless belt with a smooth inner surface for use in an extended press nip for dewatering a fibrous web formed in a papermaking machine.

During the papermaking process, a web is formed by depositing a fibrous slurry on a forming wire. A large amount of water is drained from the slurry during this process, after which the newly-formed web proceeds to a press section which includes a series of press nips. The web finally proceeds to a drying section including heated dryer drums where the water content is reduced to a desirable level.

In view of the high costs of energy, is is desirable to remove as much water as possible from the web prior to its entering the drying section. In this respect the use of extended nip presses has been found to be advantageous as by extending the time the web is subjected to pressure in the nip, a greater amount of water can be removed. Several patents such as US patents Re. 30 268, 4 201 624, 4 229 253 and 4 229 254 have been granted in this area.

In using extended press nips to dewater a fibrous web, the web is sandwiched between two moisture absorbing felts. The felts are trained around a cylindrical press roll with the web between them while a belt is arranged to transfer the pressure exerted by a pressure shoe to the felts and roll.

The belt is provided with a very smooth surface for contacting the shoe so that it can transfer pressure to the felts and the fibrous web without overheating or wearing away. Furthermore the belt must be impermeable to oil used to lubricate its passage over the shoe which could contaminate the felts and the web.

Heretofore the belt was made by applying a polymer coating to the outer surface of an endless fabric. Since the belt is arranged so that its inner surface is the shoe-contacting surface, the endless coated fabric is then reversed (i.e. turned inside out). While this procedure was satisfactory for belts having a length of 7.4 m (24 feet) or more it has been found that it is difficult to reverse belts having a length of less than 7.4 m. Furthermore it was found that it was difficult to apply the coating to the outer surface of shorter belts.

GB-A 2 106 557 shows a belt which is impregnated on only one side, that which comes into direct contact with the shoe. The other side is left unimpregnated and, as a consequence, provided voids for the temporary storage of water pressed from the wet paper sheet. The endless fabric from which the belt is made is stretched between two rollers and coated on the inside. Yet the coated surface still has to be ground smooth. No mandrel is used for the manufacture of the known belt.

DE-A 3 318 984 teaches to pour a liquid polymer onto the moving fabric base held unter tension. The base fabric is placed on a rotating cylinder, and the liquid polymer material is then applied to the fabric by means of a nozzle which travels back and forth parallel to the cylinder axis. However, the centrifugal force arising from the rotational motion of the cylinder would act to oppose the impregnation of the fabric by the polymer if the cylinder were to rotate too quickly. It would also appear that applying the liquid polymer material onto the fabric base with a nozzle would introduce air bubbles into the polymer.

It is the object of the present invention to provide a relative simple method by which even a relatively short endless belt with a smooth inner surface and impermeable to oil, adapted to be used in an extended press nip, can be produced.

The proposed method is characterized by the following steps:

a) providing an endless base fabric of open structure,

b) providing a cylindrical, hermetically sealable mold with a smooth mandrel and a uniformly spaced outer shell,

c) disposing the endless belt fabric within said mold on said mandrel,

d) evacuating the mold by a vacuum source, and

e) injecting a polymer into the space between the mandrel and shell to totally impregnate the fabric of open structure, and causing the polymer to be cross-linked.

With the proposed method a smooth inner surface of the finished endless belt is provided by the smooth outer surface of the mandrel so that no subsequent finishing is necessary. By the use of a hermetically sealable mold and the application of vacuum a complete and thorough impregnation free of voids of the open-structure base fabric is obtained.

Brief Description of the Drawings

Fig. 1 is a side elevational view of an extended nip press employing a belt produced by the proposed method.

Fig. 2 is a partial sectional front view of the press nip shown in Fig. 1.

Fig. 3 is a sectional side elevational view of the belt produced by the proposed method.

Fig. 4 is a partial sectional view of an apparatus for performing the proposed method.

Detailed Description of the Invention

An extended press is provided for dewatering a travelling web of material. The nip 10 is defined by a cylindrical press roll 12, a pressure shoe 14 having an arcuate surface facing the press roll, and a belt 16 arranged such that it bears against the surface of the press roll. The arcuate surface of the pressure shoe has about the same radius of curvature as the press roll. The distance between the press roll and the pressure shoe may be adjusted by means of conventional hydraulic or mechanical apparatus (not shown) connected to a rod 18 pivotally secured to the shoe 14. The rod may also be actuated to apply the desired pressure to the shoe. It will be appreciated that the pressure shoe and press roll described above as shown in Figures 1-2 are conventional and that other arrangements are also well known in the art.

Paper web 24 is carried to and away from the nip by a first felt 26. A second felt 28 is used to absorb the water expressed from web 24 in the nip.

A lubricating means 30 is used to apply a lubricant such as oil to the inner surface 16' of belt 16 to further reduce friction between said inner surface and shoe 14. The belt is entrained by rollers 32 used to drive the belt in a predetermined path as shown.

The belt 16 employed in accordance with the invention is shown in detail in Figure 3. It has proven to be superior to belts currently known to the art both from an operational standpoint and for manufacturing considerations. The belt 16 comprises a base fabric 34 which is impregnated with a polymeric material 36. Thermosetting resins such as polyurethanes have been found to be suitable impregnating materials. Preferably a 100% polyurethane resin should be used to avoid formation of bubbles during the curing of the belt structure. Thermoplastic polymers such as polypropylene are also acceptable.

The base fabric 34 is sufficiently open to allow total impregnation. This eliminates the possibility of any voids forming in the final fabric which would allow the lubrication used between the belt and shoe to pass through the belt and contaminate the felt and fibrous web. It is endless in final construction and uniform in thickness. The fabric must also be made to have sufficient stability under paper machine conditions. In other words, it must have length stability, width stability, and guideability.

The base fabric may comprise a single or multilayered flat woven fabric which has been heat stabilized and joined using normal joining techniques. The base fabric may be made of polyester or other polymeric materials having the necessary properties in accordance with the invention. The base may be made endless by endless weaving also.

At least one of the sides or surfaces of the belt, such as side 16', is smooth for contacting the pressure shoe 14.

Belts manufactured in accordance with the invention have been found to have many desirable characteristics. They move easily over the pressure shoe and are capable of transmitting pressure from the shoe to the web and press roll. Sufficient flexibility is obtained, and the belts have proven to be unaffected by lubricant applied prior to entering the press nip.

The belt is manufactured in a cylindrical mold 38 (Figure 4) with an outer shell 39 and a concentric mandrel 42. The mandrel is provided with a smooth outer surface 40. The spacing between the outer shell 39 of the mold and the inner mandrel determines the thickness or caliper of the belt. The base fabric 34 is first placed on the smooth mandrel surface 40 and then the mold 38 is hermetically sealed with cover 44. Next, the pressure within the mold is reduced by substantially removing the air contained therein via a pipe 46 connected to a vacuum source (not shown). After the pressure within the mold has been reduced, an appropriate polymer is injected into the mold through pipe 48. Because of the low pressure inside the mold, the polymer quickly fills the mold including the interstices of the fabric. Advantageously, a smooth inner polymer surface is formed along the mandrel surface 40. The polymer is cross-linked by applying heat to the mold. After the polymer has cured the finished belt may be removed from the mold.

Alternatively a polymer catalyst mixture may be used which is self cross linking if left undisturbed several hours.

The resulting belt is shown in Figure 3, with the fabric 34 being fully impregnated with and impermeable to oil and other substances. The belt has a uniform caliper as a result of the molding operation.

Numerous modifications can be made to the invention without departing from its scope as defined in the appended claims.

Claims

1. A method for coating an endless belt fabric to produce an endless belt with a smooth inner surface, for use in a papermaking extended nip press, comprising:
   a) providing an endless base fabric of open structure,
   b) providing a cylindrical, hermetically sealable mold with a smooth mandrel and a uniformly spaced outer shell,
   c) disposing the endless base fabric within said mold on said mandrel,
   d) evacuating the mold by a vacuum source, and
   e) injecting a polymer into the space between the mandrel and shell to totally impregnate the fabric of open structure, and causing the polymer to be cross-linked.

2. The method of claim 1 wherein said cylindrical mold is maintained in a stationary condition.

3. The method of claim 1 wherein said polymer is directly injected into said space via a feed pipe having an exit and located within said uniformly spaced area between the smooth mandrel and the outer shell.

4. The method of claim 1 wherein heat is applied to the mold to cross-link the polymer.

5. The method of claim 1 wherein said base is a woven material.

Patentansprüche

1. Verfahren zur Beschichtung eines Textilerzeugnisses für ein Endlos-Band zur Herstellung eines Endlos-Bandes mit einer glatten Innenfläche für eine Papiermaschinenpresse mit verlängertem Preßspalt, dadurch gekennzeichnet, daß
   a) ein als Basis dienendes, endloses, offenes Textilerzeugnis bereitgestellt,
   b) eine zylindrische, hermetisch abdichtbare Form mit einem glatten Dorn und einer gleichmäßig beabstandeten äußeren Hülle vorgesehen,
   c) das endlose Textilerzeugnis innerhalb der Form auf den Dorn aufgebracht,
   d) die Form durch eine Unterdruckquelle evakuiert, und
   e) ein Polymer in den Raum zwischen dem Dorn und der Hülle eingespritzt wird, um das offene

Textilerzeugnis durchgehend zu tränken, und das Polymer vernetzt wird.

2. Verfahren nach Anspruch 1, wobei die Form in stationärem Zustand gehalten wird.

3. Verfahren nach Anspruch 1, wobei das Polymer direkt in den besagten Raum mittels eines Zuführungsrohres eingespritzt wird, das einen Auslaß hat und in dem gleichmäßigen breiten Bereich zwischen dem glatten Dorn und der äußeren Hülle angeordnet ist.

4. Verfahren nach Anspruch 1, wobei der Form Hitze zugeführt wird, um das Polymer zu vernetzen.

5. Verfahren nach Anspruch 1, wobei die Basis ein gewebtes Material ist.

Revendications

1.- Procédé pour revêtir un tissu de bande sans fin pour obtenir une bande sans fin avec une surface intérieure lisse, destinée à être utilisée dans une presse à papier à intervalle allongé, comprenant les stades suivants:

a) procurer un tissu de base sans fin à structure ouverte;

b) procurer un moule cylindrique pouvant être fermé de façon hermétique avec un mandrin lisse et une enveloppe extérieure uniformément espacée du mandrin;

c) disposer le tissu de base sans fin à l'intérieur du moule sur le mandrin;

d) faire le vide dans le moule à l'aide d'une source de vide; et

e) injecter un polymère dans l'espace entre le mandrin et l'enveloppe pour imprégner totalement le tissu à structure ouverte et faire réticuler le polymère.

2.- Procédé selon la revendication 1, dans lequel le moule cylindrique est maintenu en condition stationnaire.

3.- Procédé selon la revendication 1, dans lequel le polymère est directement injecté dans l'espace par l'intermédiaire d'un tube d'alimentation ayant une sortie et disposé à l'intérieur de la zone d'espacement uniforme entre le mandrin lisse et l'enveloppe extérieure.

4.- Procédé selon la revendication 1, dans lequel on chauffe le moule pour réticuler le polymère.

5.- Procédé selon la revendication 1, dans lequel le tissu de base est un matériau tissé.

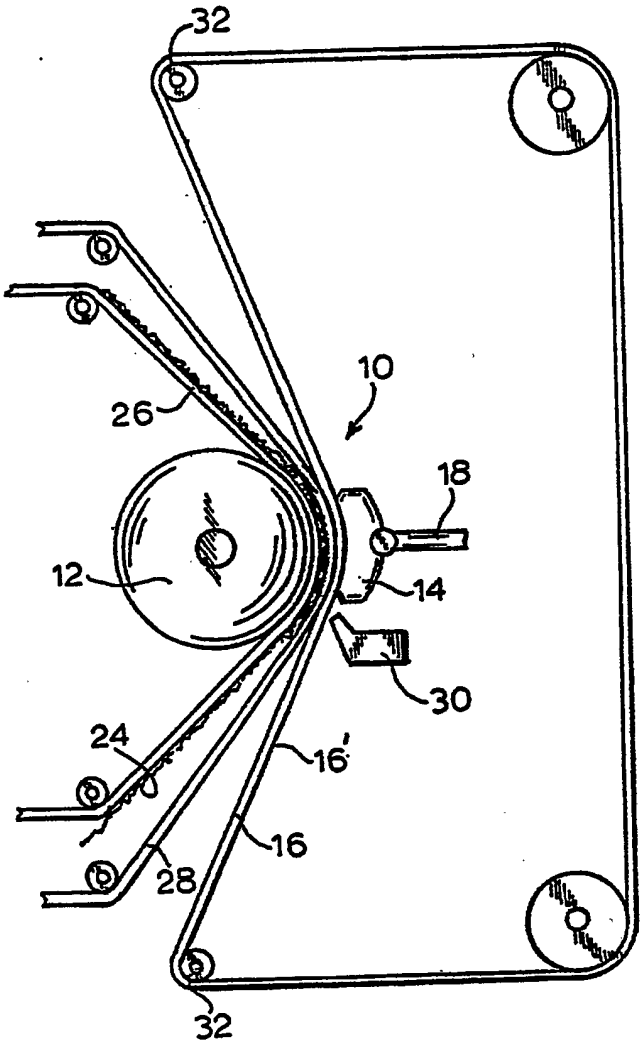

FIG.1

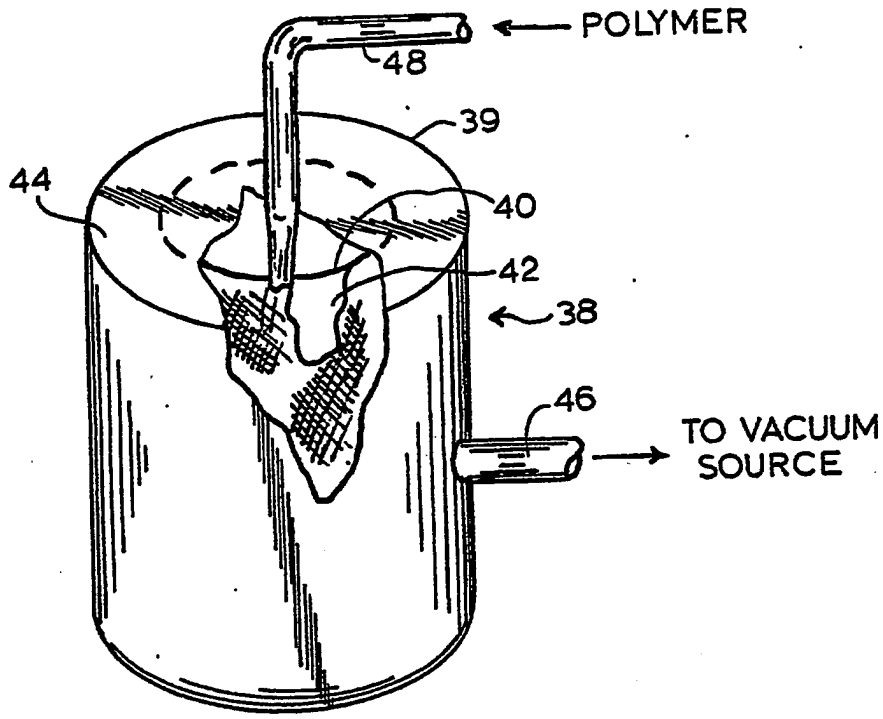

FIG. 4

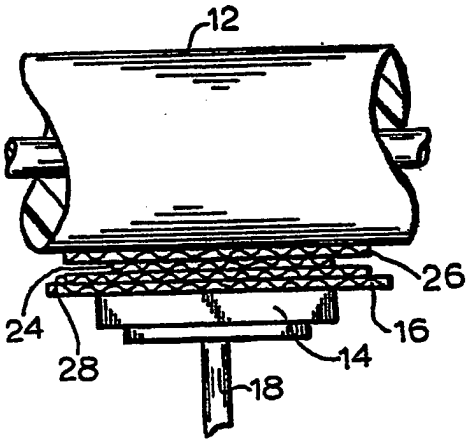

FIG. 2

FIG. 3